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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES



APPELLANT: Tom Weidner CONFIRMATION NO. 3480
SERIAL NO.: 10/659,230 GROUP ART UNIT: 2615
FILED: September 10, 2003 EXAMINER: Daniel Swerdlow
TITLE: FEEDBACK COMPENSATION METHOD AND CIRCUIT FOR
AN ACOUSTIC AMPLIFICATION SYSTEM, AND HEARING
AID DEVICE EMPLOYING SAME

MAIL STOP APPEAL BRIEF-PATENTS

Commissioner for Patents
P.O. Box 1450
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APPELLANT'S MAIN APPEAL BRIEF

SIR:

In accordance with the provisions of 37 C.F.R. §41.37, Appellant herewith submits his main brief in support of the appeal of the above-referenced application.

REAL PARTY IN INTEREST:

The real party in interest is the assignee of the application, Siemens Audiologische Technik GmbH, a German company.

RELATED APPEALS AND INTERFERENCES:

There are no related appeals and no related interferences.

STATUS OF CLAIMS:

The original application was filed with claims 1-69, and no claim was added or cancelled during prosecution before the Examiner. All claims 1-69 currently stand as finally rejected in the Office Action dated July 19, 2006.

STATUS OF AMENDMENTS:

A response to the Final Rejection was filed on October 19, 2006, but no claim amendments were made. In an Advisory Action dated November 3, 2006, the

Examiner stated the response had been considered but the rejections were maintained.

SUMMARY OF CLAIMED SUBJECT MATTER:

The subject matter of the claims on appeal generally involves adaptive feedback compensation in an acoustic device, such as a hearing aid. The claims on appeal include three independent claims, claim 1 being directed to a feedback compensator, claim 35 being directed to a hearing aid that includes such a feedback compensator, and claim 36 directed to a method for compensating feedback in an acoustic amplification system. Those three independent claims are set forth below, with exemplary citations to the specification and drawings for the components and steps set forth therein. Following after the independent claims is a more detailed summary of the claimed subject matter.

1. A feedback compensator (1) for use in an acoustic amplification system to compensate feedback that acts on an input signal, upon amplification of said input signal, due to a feedback path from an amplified output signal (p.12, I.2-8), said feedback compensator (1) comprising:

an adaptive feedback compensation filter (FIR filter 15, adapted by adaptation unit 17, p.12, I.21 - p.13, I.6), supplied as an input with said amplified output signal (p. 12, I.15-17), that generates a compensation signal (signal 8, p.12, I.17), from said amplified output signal, for compensating said feedback, said compensation signal being combined with said input signal (p.12, I.17-20); and

a frequency-limiting filter (13) connected relative to said adaptive feedback compensation filter to limit a frequency range within which said

adaptive feedback compensation filter compensates said feedback by frequency-limiting said input to said adaptive feedback compensation filter formed by said amplified output signal (p.17, I.15-17), said frequency-limiting filter having a filter function that is adaptable during compensation of said feedback by said adaptive feedback compensation filter (filter function of filter 13 is adapted by control unit 25. p. 13, I.7-19).

35. A hearing aid comprising:

an input transducer that produces an input signal from an incoming acoustic signal (acoustic input signal 3; p.12, I.2-4);

a hearing aid signal processor supplied with said input signal that amplifies said input signal to produce an amplified output signal, said input signal being influenced by feedback, via a feedback path, upon amplification thereof (p. 12, I.2-5);

an adaptive feedback compensation filter (FIR filter 15, adapted by adaptation unit 17, p.12, I.21 - p.13, I.6), supplied as an input with said amplified output signal (p. 12, I.15-17), that generates a compensation signal (signal 8, p.12, I.17), from said amplified output signal, for compensating said feedback, said compensation signal being combined with said input signal (p.12, I.17-20); and

a frequency-limiting filter (13) connected relative to said adaptive feedback compensation filter to limit a frequency range within which said adaptive feedback compensation filter compensates said feedback by frequency-limiting said input to said adaptive feedback compensation

filter formed by said amplified output signal (p.17, l.15-17), said frequency-limiting filter having a filter function that is adaptable during compensation of said feedback by said adaptive feedback compensation filter (filter function of filter 13 is adapted by control unit 25. p. 13, l.7-19).

36. A method for compensating feedback in an acoustic amplification system, said feedback acting on an input signal, upon amplification of said input signal (p. 12, l.2-8), due to a feedback path from an amplified output signal, said method comprising the steps of:

generating a compensation signal in an adaptive feedback compensation filter, supplied as an input with said amplified output signal, from said amplified output signal, for compensating said feedback, and combining said compensation signal with said input signal (p.12, l.12-20); and

limiting a frequency range within which said adaptive feedback compensation filter compensates said feedback with a frequency-limiting filter connected relative to said adaptive feedback compensation by frequency-limiting said input to said adaptive feedback compensation filter formed by said amplified output signal (p.12, l.15-17), and adapting a filter function of said frequency-limiting filter during compensation of said feedback by said adaptive feedback compensation filter (p.13, l.7-19).

Figure 1 is a schematic overview of a feedback compensator 1 in accordance with the claims on appeal that also enables a qualitatively good amplification of an

acoustic input signal 3 with a hearing aid device signal processor 5, in the event that a feedback path is present, the frequency range of which can change due to varying external conditions. (p.12, I.2-5) The feedback path 7 is, for example, determined by the diameter and by the position of the ventilation aeration holes of an in-the-ear hearing aid device as well as by an imperfect termination of the in-the-ear hearing aid device with the ear. (p.12, I.5-8) Changes of the feedback path 7 also ensue when the acoustic surroundings change, for example when a helmet is put on or taken off. (p.12, I.8-10)

The feedback compensator 1 is able to adapt the frequency range of the compensation signal 8 to the changing frequency range of the feedback path 7. For this, the feedback compensator 1 generates the compensation signal 8 in the following way. (p.12, I.11-14) A small part of the output signal 11 of the hearing aid device signal processor 5 is tapped at a node 12 for the feedback compensator 1. There, it is restricted with a filter 13 with regard to the frequency range, and supplied to an FIR filter 15. (p.12, I.14-17) The FIR filter 15 generates the compensation signal 8, by means of its filter function, from the signal filtered by the filter 13. For feedback compensation, the compensation signal 8 is subtracted from the input signal 3, before it is supplied to the hearing aid device signal processor 5. (p.12, I.17-20)

The setting of the filter function of the FIR filter 15 ensues by means of filter coefficients 16 that are transmitted from an adaptation unit 17 to the FIR filter 15. (p.12, I.21-22) For adaptation, the adaptation unit 17 compares an error signal 19, tapped from the input signal 3 after combining with the compensation signal 8, to the output signal 11 filtered with the filter 13. (p.12, I.23-25) Both signals are restricted

with regard to their frequency range with respective filters 21 and 23. By changing the coefficients 16 of the FIR filter 15, the adaptation unit 17 strives to prevent the feedbacks. (p.12, I.25 -p.13, I.2) As a control factor, for example, the signal energy of the error signal 19 normalized to the output signal 11 filtered with the filter 13 can be used. The coefficients 16 of the FIR filter 15 are changed such that the signal energy of the error signal 19 is minimal, i.e. free of feedback. (p.13, I.2-6)

It is of significant importance for the adaptation of the frequency range of the compensation signal 8 to the changing frequency range of the feedback path 7 that the filters 13, 21, and 23 are adaptable in regards to their filter function. (p.13, I.7-9) The adaptation ensues by the filter coefficients of the filter being adjusted by an analysis and control unit 25. (p.13, I.9-11) The analysis and control unit 25 is connected with the adaptation unit 17 to exchange information about, for example, the filter coefficients 16 of the FIR filter. (p.13, I.11-13) A comparison of the coefficients 16 with the coefficients or filter functions of the three filters 13, 21, and 23 enables the analysis and control unit 25 to re-adjust the three filters 13, 21, 23 with regard to their filter function, such that they overlay with the filter function of the FIR filter 15. (p.13, I.13-16) The analysis and control unit 25 then informs the adaptation unit 17 about the adaptation increment and adaptation speed that best matches the frequency ranges adjusted by the three filters 13, 21, and 23. (p.13, I.16-19)

Figure 2 shows the curves for certain coefficients explaining procedure for the adaptation of the filter function of, for example, the filter 13. (p.13, I.20-21) The amplitude of the feedback path 7 is shown dependent on the frequency, for the case of feedback in a narrow frequency range (feedback amplitude 27), and for the case

of a change in the acoustic surrounding that leads to a feedback risk in a large frequency range (feedback amplitude 29). (p.13, I.21-25) For both cases, the transmission of the filter 13 is additionally plotted. The transmission curve 31 for the first case is centered around 2 kHz. The transmission drops off to lower frequencies corresponding to the feedback amplitude, such that only signal energy above 1 kHz is transferred for feedback compensation to the FIR filter 15. (p.13, I.25 - p.14, I.4) In the second case, due to the changes in the acoustic surrounding, feedbacks are also possible in the frequency range from 0.5 kHz to 1 kHz. (p.14, I.4-6) The analysis and control unit 25 of the feedback compensator 1 thereupon adjusts a new filter function for the filter 13 (transmission curve 33) that lets pass to the FIR filter 15 a significantly increased frequency range of approximately 0.5 kHz to 2.5 kHz. To assess the feedback risk, the stability limit is additionally shown in Figure 2. (p.14, I.6-10)

Figure 3 is a schematic block diagram of a feedback compensator 39 that substantially coincides with regard to assembly and functionality with the feedback compensator 1 in Figure 1. The important difference is in the realization of the filters 13, 21, and 23 and in the adaptation of their filter functions to limit the frequency range of the feedback compensation. (p.14, I.11-15)

The filters 13, 21, and 23 are respectively formed by filter sets 41, 43, and 45 and changeover switches 47, 49, and 51. (p.14, I.16-17) The filters of the filter sets 41, 43, and 45 cover the frequency range relevant for the feedback. (p.14, I.17-18) The adaptation of the filter functions ensues via switches between the different filters of the filter sets 41, 43, 45 to be switched or via the combined use of a selection of filters in order to add their functions. (p.14, I.18-21) The changeover switches 47,

49, 51 are controlled by the analysis and control unit 25. (p.14, I.21-22) The analysis and control unit 25 in addition compares, as in Figure 1 the different filter functions with the coefficients of the three filters 13, 21, and 23 and adapts the filter functions of the three filters 13, 21, 23 as best possible to the filter function of the FIR filter 15. (p.14, I.22-25) In contrast to the feedback compensator 1, the feedback compensator 39 has the advantage that the realization of the filters 13, 21, and 23 with use of the changeover switches 47, 49, and 51 and the fixed preset filters of the filter sets 41, 43, and 45 is simpler, space saving, and energy saving. It has the disadvantage, however, that the filter functions in terms of their gradient can not be as adapted as precisely as can be accomplished with the feedback compensator 1 of Figure 1. (p.14, I.25-p.15, I.6))

An exemplary segmentation of the frequency range relevant to feedback between 0.5 kHz and 6 kHz on the filter of a filter set, for example, the four filters 53, 55, 57, and 59 of the filter set 41, is shown in Figure 4. (p.15, I.7-9) The transmission ranges of the filters 53, 55, 57, and 59 extend starting from different lower limit frequencies to the common upper limit of 6 kHz. To suppress the feedback amplitude 27, the use of the filter 57 is sufficient. (p.15, I.9-12) Given a change in the feedback amplitude 29 with a feedback risk in a broader frequency range, the analysis and control unit 25 recognizes this expansion and controls the changeover switch 47 such that the filter 53 is used for frequency limiting. (p.15, I.12-15)

Figure 5 shows an alternative segmentation of the frequency range with the filters 53, 55, 57, and 59, which are in this case narrowband filters. The transmission ranges of the filters 53, 55, 57, and 59 mutually cover the frequency range relevant

for the feedback. (p.15, I.16-19) The transmission ranges overlap in the edge zones. The feedback amplitude 27 is sufficiently compensated via the use of the filters 53 and 55, while all four filters 53, 55, 57, and 59 are simultaneously used by the changeover switch 47 for the feedback amplitude 29. (p.15, I.19-22)

A feedback compensator 1 is shown in Figure 6, the functionality and operation of which again substantially correspond to that of the feedback compensators 1 and 39 in the Figures 1 and 3. (p.15, I.23-25) The analysis and control unit 25 additionally has an oscillation detector 67 that is connected with the input signal after the infeed of the compensation signal 8. (p.15, I.25 - p.16, I.2) The oscillation detector 67 examines the input signal 3 for oscillations that dominate the input signal 3 and give an indication of a feedback risk outside of the covered frequency range. (p.16, I.2-4) If the analysis and control unit 25 recognizes a new feedback frequency with the aid of the oscillation detector 67, the filter function of the filters 13, 21, and 23 is expanded to this new frequency range. The advantage of this exemplary embodiment is that for the most part an oscillation detector that is already present in the hearing aid device can be used for this purpose. This simplifies the realization of the feedback compensator 65. (p.16, I.4-10)

A schematic diagram of a further exemplary embodiment for a feedback compensator is shown in Figure 7. The feedback compensator 71 arises substantially from the combination of the feedback compensator 39 from Figure 3 and 65 from Figure 6. (p.16, I.11-14) This particular advantageous embodiment combines the simply realized changeover switch device between different filters and the use of an oscillation detector that is generally already present to analyze feedback. The quality and speed of the adaptation process to adjust the filter

function of the FIR filter 15 can also be increased here, by the frequency range adaptation of the filters 13, 21, and 23. (p.16, l.14-19)

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL:

The following issues are presented in this appeal:

Whether the subject matter of claims 1, 10-12, 14-36, 45-47 and 49-69 is anticipated under 35 U.S.C. §102(e) by United States Patent No. 6,831,986 (Kates '986);

Whether the subject matter of claims 1-9 and 36-44 is anticipated under 35 U.S.C. §102(b) by United States Patent No. 6,072,884 (Kates '884); and

Whether the subject matter of claims 13 and 48 would have been obvious to a person of ordinary skill in the field of compensating acoustic feedback, under the provisions of 35 U.S.C. §103(a) based on the teachings of Kates '986 and the teachings of United States Patent No. 6,404,895 (Weidner).

ARGUMENT:

Rejection of Claims 1, 10-12, 14-36, 45-47 and 49-69 as Being Anticipated by Kates '986

In substantiating the anticipation rejection based on the Kates '986 reference, the Examiner stated the Kates reference discloses a feedback cancellation or compensation arrangement for use in a hearing having an adaptive filter 401. The Examiner stated that any of filters 419, 421 or 423 could be considered as corresponding to the frequency-limiting filter as claimed. The Examiner stated these filters limit the frequency range within which the compensation filter compensates feedback, citing column 3, lines 30-34 and column 8, lines 30-51.

Appellant submits that the frozen filter 419 is not adapted during operation of the hearing aid. As stated at column 8, lines 6-7, the frozen filter 419 is a slow-

varying or non-varying filter. If the filter 419 is a non-varying filter, it clearly does not fall into the category of an “adaptive” filter. Even if the filter 419 is a slow-varying filter, there is no control input shown for the filter 419 in Figure 4 of the Kates '986 reference, and thus there is no disclosure in that reference as to how, if at all, the slow varying is accomplished. Additionally, the fact that the filters 421 and 423 in the Kates '986 reference are explicitly called “adaptive filters”, whereas this terminology was not used to describe the filter 419, clearly indicates that Kates '986 did not consider the filter 419 as being an “adaptive” filter, nor would a person of ordinary skill reading the Kates '986 reference.

In the Final Rejection, in response to these arguments, the Examiner cited language at column 8, lines 16-19 as stating that the frozen filter 419 is disclosed as being changeable during operation. Appellant submits this statement does no more than refer to the possibility of the frozen filter 419 slowly varying during operation, but this clearly does not make the frozen filter 419 a filter that adapts during operation of the hearing aid, and this is made explicitly clear in the other text surrounding the passage cited by the Examiner. As stated at column 8, line 12 of the Kates '986 reference, when the hearing aid 400 is first turned on, filter (pole) coefficients of the frozen filter 419 are adapted to model those aspects of the feedback path that can have high-Q resonance, but which stay relatively constant during normal hearing aid operation. The Kates '986 reference then further states that these pole coefficients of the feedback path, once determined, are modified and then frozen, or at least changed very slowly. The next sentence in the Kates '986 reference specifically contrasts this situation to the situation in the “true” adaptive filter 401, which states that the coefficients of the adaptive filter 401 are adapted to correspond to the

modified poles. At column 8, line 22, the Kates '986 reference specifically states that, *unlike the filter coefficients of the frozen filter 419*, the adaptive filter 401 continues to adapt its filter coefficients in response to changes in the feedback path. Therefore, the adaptive filter 401 models those portions of the feedback path that remain essentially constant while the hearing aid is in use.

Appellant therefore submits that the Kates '986 reference itself not only makes clear that the filter 419 does not function in the manner of an adaptive filter, but also contrasts the operation of the filter 419 with that of the "true" adaptive filter 401.

The Examiner stated in the Final Rejection and in the Advisory Action that the claims are not limited to an adaptive filter, but merely require that the filter be "adaptable." While that may be true, the language of claim 1, for example, explicitly states that the frequency-limiting filter compensates the feedback by frequency-limiting the input to the adaptive feedback compensation filter formed by the amplified signal, and states that the filter function of the frequency-limiting filter is adaptable during this compensation. Appellant submits that the frozen filter 419 in the Kates '986 reference, according to the aforementioned passages, is explicitly stated to be incapable of performing such adaptable compensation.

Additionally, even if the Examiner considers the "slowly varying" feature of the filter 419 disclosed in the Kates '986 reference to meet the language on this point in the independent claims, there is no teaching in either of those references that such slow varying, if it occurs, has anything to do with compensating feedback by frequency-limiting the input to the adaptive feedback compensation filter (this input

being formed by the amplified output signal of the adaptive feedback compensation filter), as explicitly set forth in the independent claims.

In the Advisory Action, the Examiner responded to this latter argument of the Appellant by stating that the Kates '986 reference discloses that the filter 419 "models those portions of the feedback path that remain essentially constant while the hearing aid is in use" (column 8, lines 31-33). The Examiner stated it is clear that the filter 419 thus models the frequencies it passes to those frequencies passed by the combination of elements it is intended to model.

In response, Appellant acknowledges, as stated above, that the coefficients of the frozen filter 419 are, in fact, selected to model other components in the acoustic device in which the frozen filter 419 is used. As also stated above, however, these parameters are selected and fixed, hence the description of the filter 419 as being "frozen." The filter 419 is intended to *statically* model other components by virtue of selecting and fixing these components, but once these components are set and fixed, the "modeling" ends, and the filter 419 remains frozen (or only slowly varying). The filter 419 does not *dynamically* or *adaptively* model those components, and there is no disclosure in the Kates '986 reference as to how anything other than "frozen" modeling can be achieved. As also noted above, at least a minimum necessity for the frozen filter 419 achieving some type of dynamic or adaptive filtering would be the presence of an input that would supply some type of control or setting signal to the filter 419 during operation of the acoustic device. No such input that is effective during operation is present in the Kates '986 reference, and the reason for the absence of such an input is clear: the filter 419, once the

parameters/coefficients thereof have been set, is *frozen*, and therefore no such input that is effective during operation is needed.

It is fundamental that for a reference to anticipate a patent claim, it must disclose all of the limitations of the claim in question in the same manner as those limitations are arranged and operate within the claim. As stated by the United States Court of Appeals for the Federal Circuit in *Schering Corp. v. Geneva Pharmaceuticals, Inc.*, 339 F.3d 1373 (1377, 67 U.S.P.Q.2d 1664 (Fed Cir. 2003), *reh'g and reh'g en banc denied*, 348 F.3d 992, 68 U.S.P.Q.2d 1760 (Fed. Cir. 2003)):

Anticipation under 35 U.S.C. §102 requires that a single prior art reference disclose each and every limitation of the claimed invention.

In addition to this basic requirement, however, the Federal Circuit also has emphasized that an anticipating reference must be enabling for the claimed subject matter. In other words, anticipation is not established, despite the fact that each limitation of the claim in question might be disclosed in a prior art reference, if those individual items of information are not disclosed in the reference in a manner that places the invention in the possession of the public, i.e., a person of ordinary skill in the relevant technology. In *Merck & Co. v. Teva Pharmaceuticals USA, Inc.*, 347 F.3d 1367, 1372, 68 U.S.P.Q.2d 185 (Fed. Cir. 2003), the Federal Circuit stated:

An “anticipating” reference must describe all of the elements and limitation of the claim in a single reference, and enable one of skill in the field of the invention to make and use the claimed invention.

In *Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116, 1120, 65 U.S.P.Q.2d 1051 (Fed. Cir. 2002), the Federal Circuit stated:

A single reference must describe the claimed invention with sufficient precision and detail to establish that the subject matter existed in the prior art. See, e.g. *In re Spada*, 911 F.2d, 705, 708 15 U.S.P.Q.2d 1655, 1657 (Fed. Cir. 1990) (“the reference must describe the

applicant's claimed invention sufficiently to have placed a person of ordinary skill in the field of the invention in possession of it").

Appellant respectfully submits that the above-identified statements in the Kates '986 reference concerning the frozen filter are ample evidence that the Kates '986 does not place the subject matter of any independent claims 1, 35 or 36 in the possession of a person of ordinary skill in the field of acoustic feedback compensation.

The Kates reference, therefore, does not disclose all of the structural limitations of independent claims 1 and 35, nor all of the method limitations of independent claim 36, and therefore does not anticipate any of those independent claims. The Kates '986 reference does not put the feedback compensator of claim 1, the hearing aid of claim 35, nor the feedback compensation method of claim 36 in the possession of the public.

Claims 10-12 and 14-34 add further structure to the novel combination of claim 1, and therefore none of those dependent claims is anticipated by Kates '986 for the same reasons discussed above in connection with claim 1. Claims 45-47 and 49-69 add further method steps to the novel method of claim 36, and therefore are not anticipated by the Kates '986 reference for the same reasons discussed above in connection with claim 36.

Rejection of Claims 1-9 and 36-44 as Being Anticipated by Kates '884

The Kates '884 reference discloses a filter corresponding to the frozen filter 419 in Kates '986, that in Kates '884 is called an all-pole filter 114, and at column 7, lines 36-38, it is stated that, optionally, the all-pole filter 114 may not be frozen, but instead can vary slowly. This is stated to be responsive to an adaptive signal 112

based on the error signal 104, the feedback signal 108, or the like. Further details of the adaptive signal 112, however, are not provided in Kates '884.

The filter 114 in Kates '884 performs the same type of function as the frozen filter '419 in the Kates '986 reference, and in view of the use of the same descriptive nomenclature (slowing varying) in both references, Appellants submits that the same arguments discussed above in connection with the frozen filter 419 in the Kates '986 reference apply to the filter 114 in the Kates '884 reference. Most importantly, the same basic deficiency exists in the Kates '884 reference that precludes the filter 114 from being adapted during operation of the acoustic device disclosed in the Kates '884 reference. As in the Kates '986 reference, although there is an input (input 112) to the filter 114 in the Kates '884 reference, there is no control or adjusting input that is effective *during operation* of the acoustic device that would allow the filter 114 to be adapted. Like the frozen filter 419 in the Kates '986 reference, once the parameters have been entered into the filter 114 in the Kates '884 reference, via the input 112, those parameters or coefficients are set and fixed, and do not change, or only change very slowly. As the Examiner has again noted with regard to the '884 reference, the filter 114 is intended to model other components in the acoustic device, but as argued above, Appellant submits that such modeling is only disclosed as *static* modeling, and no adaption of the filter 114 takes place during operation of the acoustic device disclosed in the '884 reference.

Therefore, for reasons similar to those discussed above with regard to the Kates '986 reference, Appellant submits that the Kates '884 reference does not disclose all of the elements of claim 1 nor all of the method steps of claim 36, and therefore does not anticipate either of those claims. The Kates '884 reference does

not put the feedback compensator of claim 1, nor the feedback compensation method of claim 36 in the possession of the public.

Claims 2-9 add further structure to the novel combination of claim 1, and therefore none of those dependent claims is anticipated by Kates '884 for the same reasons discussed above in connection with claim 1. Claims 37-44 add further method steps to the novel method of claim 36, and therefore none of those dependent claims is anticipated by Kates '884 for the same reasons discussed above in connection with claim 36.

Rejection of Claims 13 and 48 under 35 U.S.C. §103(a) based on Kates '986 and Weidner

Appellant does not have a significant disagreement with the Examiner's statements concerning the teachings of the Weidner reference, but for the reasons discussed above even if the Kates '986 device were modified in accordance with those teachings, the subject matter of claims 13 and 48, which respectively embody the subject matter of claims 1 and 36 therein, still would not result. Neither of claims 13 nor 48, therefore, would have been obvious to a person of ordinary skill in the field of acoustic feedback compensation, under the provisions of 35 U.S.C. §013(a), based on the teachings of Kates '986 and Weidner.

CONCLUSION:

For the foregoing reasons, Appellant respectfully submits the rejections of claims 1-69 are improper as a matter of fact and as a matter of law. Reversal of those rejections is therefore appropriate, and the same is respectfully requested.

This Appeal Brief is accompanied by a check for in the amount of \$500.00 for the fee required by 37 C.F.R. §41.20(b)(2).

Submitted by,

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CERTIFICATE OF MAILING

I hereby certify this correspondence is being deposited with the United States Postal Service as First Class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on January 12, 2007.

Steven H. Noll

STEVEN H. NOLL

CLAIMS APPENDIX

1. A feedback compensator for use in an acoustic amplification system to compensate feedback that acts on an input signal, upon amplification of said input signal, due to a feedback path from an amplified output signal, said feedback compensator comprising:

an adaptive feedback compensation filter, supplied as an input with said amplified output signal, that generates a compensation signal, from said amplified output signal, for compensating said feedback, said compensation signal being combined with said input signal; and

a frequency-limiting filter connected relative to said adaptive feedback compensation filter to limit a frequency range within which said adaptive feedback compensation filter compensates said feedback by frequency-limiting said input to said adaptive feedback compensation filter formed by said amplified output signal, said frequency-limiting filter having a filter function that is adaptable during compensation of said feedback by said adaptive feedback compensation filter.

2. A feedback compensator as claimed in claim 1 wherein said frequency-limiting filter is comprised of a plurality of individual filters, having respective filter functions that, in combination, form said filter function of said frequency-limiting filter.

3. A feedback compensator as claimed in claim 2 wherein said individual filters have respectively different filter functions, and wherein at least one of said individual filters is selectable to adapt said filter function of said frequency-limiting filter.

4. A feedback compensator as claimed in claim 2 wherein said feedback may occur within a frequency range, and wherein the respective filter functions of said individual filters, in combination, cover said frequency range.

5. A feedback compensator as claimed in claim 1 wherein said frequency-limiting filter has filter coefficients associated therewith, and wherein said filter function of said frequency-limiting filter is adapted by modification of said coefficients.

6. A feedback compensator as claimed in claim 1 wherein said amplified output signal is supplied to the adaptive feedback compensation filter through said frequency-limiting filter.

7. A feedback compensator as claimed in claim 1 further comprising a control unit connected to said frequency-limiting filter for adapting said filter function of said frequency-limiting filter.

8. A feedback compensator as claimed in claim 7 wherein said frequency-limiting filter is comprised of a plurality of individual filters having respectively different filter functions that in combination form said filter function of said frequency-limiting filter, and further comprising a changeover switch operated by said control unit to select at least one of said individual filters for adapting said filter function of said frequency-limiting filter.

9. A feedback compensator as claimed in claim 7 wherein said frequency-limiting filter has filter coefficients, and wherein said control unit adjusts at least one of said filter coefficients to adapt said filter function of said frequency-limiting filter.

10. A feedback compensator as claimed in claim 1 wherein said compensation signal is combined with said input signal to produce a feedback-

compensated input signal, and wherein said feedback compensator further comprises an analysis unit connected to analyze said feedback-compensated input signal to determine an effectiveness of said feedback compensation.

11. A feedback compensator as claimed in claim 10 wherein said analysis unit determines said effectiveness of said feedback compensation by checking a parameter of said adaptive feedback compensation filter.

12. A feedback compensator as claimed in claim 10 wherein said analysis unit determines the effectiveness of said feedback compensation by comparing said feedback-compensated input signal to said output signal with regard to feedback content.

13. A feedback compensator as claimed in claim 10 wherein said analysis unit is an oscillation detector which measures said feedback in a frequency range.

14. A feedback compensator as claimed in claim 1 wherein said input signal is subject to feedback via an acoustic feedback path.

15. A feedback compensator as claimed in claim 1 wherein said input signal is subject to feedback via an electromagnetic feedback path.

16. A feedback compensator as claimed in claim 1 comprising an adaptation unit, connected to said adaptive feedback compensation filter, for modifying operation of said adaptive feedback compensation filter dependent on evaluation of a signal within said acoustic amplification system.

17. A feedback compensator as claimed in claim 16 wherein said adaptation unit is connected to receive said input signal for error signal evaluation thereof.

18. A feedback compensator as claimed in claim 17 wherein said input signal is supplied to said adaptation unit through a further frequency-limiting filter.

19. A feedback compensator as claimed in claim 18 wherein said further frequency-limiting filter has a filter function that is adaptable during compensation of said feedback by said adaptive feedback compensation filter.

20. A feedback compensator as claimed in claim 19 further comprising a control unit connected to said frequency-limiting filter and said further frequency-limiting filter to adapt the respective filter functions of said frequency-limiting filter and said further frequency-limiting filter.

21. A feedback compensator as claimed in claim 20 wherein said further frequency-limiting filter is comprised of a plurality of individual filters having respectively different filter functions that in combination form the filter function of said further frequency-limiting filter, and wherein said feedback compensator further comprises a changeover switch operated by said control unit to select at least one of said individual filters to adapt said filter function of said further frequency-limiting filter.

22. A feedback compensator as claimed in claim 20 wherein said further frequency-limiting filter has filter coefficients, and wherein said control unit adjusts at least one of said filter coefficients to adapt said filter function of said further frequency-limiting filter.

23. A feedback compensator as claimed in claim 16 wherein said adaptation unit is connected to receive an output of said frequency-limiting filter.

24. A feedback compensator as claimed in claim 23 further comprising a further frequency-limiting filter through which said output of said frequency-limiting filter is supplied to said adaptation unit.

25. A feedback compensator as claimed in claim 24 wherein said further frequency-limiting filter has a filter function that is adaptable during generation of said compensation of said feedback by said adaptive feedback compensation filter.

26. A feedback compensator as claimed in claim 25 further comprising a control unit connected to said frequency-limiting filter and said further frequency-limiting filter to adapt the respective filter functions of said frequency-limiting filter and said further frequency-limiting filter.

27. A feedback compensator as claimed in claim 26 wherein said further frequency-limiting filter is comprised of a plurality of individual filters having respectively different filter functions that in combination form the filter function of said further frequency-limiting filter, and wherein said feedback compensator further comprises a changeover switch operated by said control unit to select at least one of said individual filters to adapt said filter function of said further frequency-limiting filter.

28. A feedback compensator as claimed in claim 26 wherein said further frequency-limiting filter has filter coefficients, and wherein said control unit adjusts at least one of said filter coefficients to adapt said filter function of said further frequency-limiting filter.

29. A feedback compensator as claimed in claim 16 wherein said frequency-limiting filter is a first frequency-limiting filter, and wherein said adaptation unit is connected to receive said input signal and to receive an output from said first

frequency-limiting filter, and wherein said feedback compensator further comprises a second frequency-limiting filter through which said input signal is supplied to said adaptation unit, and a third frequency-limiting filter through which said output from said first frequency-limiting filter is supplied to said adaptation unit.

30. A feedback compensator as claimed in claim 29 wherein said second frequency-limiting filter has a filter function that is substantially identical to a filter function of said third frequency-limiting filter.

31. A feedback compensator as claimed in claim 29 wherein each of said second and third frequency-limiting filters has a filter function that is adaptable during compensation signal of said feedback by said adaptive feedback compensation filter.

32. A feedback compensator as claimed in claim 31 further comprising a control unit connected to said first, second and third frequency-limiting filters for adapting the respective filter functions of said first, second and third frequency-limiting filters.

33. A feedback compensator as claimed in claim 32 wherein each of said second and third frequency-limiting filters is comprised of a plurality of individual filters having respectively different filter functions that in combination form the respective filter functions of said first, second and third frequency-limiting filters, and wherein said frequency compensator further comprises a first changeover switch operable by said control unit to select at least one of said individual filters of said second frequency-limiting filter to adapt the filter function of said second frequency-limiting filter, and a second changeover switch operable by said control unit to select at least one of the individual filters of said third frequency-limiting filter to adapt the filter function of the third frequency-limiting filter.

34. A feedback compensator as claimed in claim 32 wherein each of said second and third frequency-limiting filters has filter coefficients, and wherein said control unit adjusts at least one of the filter coefficients of said second frequency-limiting filter to adapt the filter function of the second frequency-limiting filter, and adjusts at least one of the filter coefficients of the third frequency-limiting filter to adapt the filter function of the third frequency-limiting filter.

35. A hearing aid comprising:

an input transducer that produces an input signal from an incoming acoustic signal;

a hearing aid signal processor supplied with said input signal that amplifies said input signal to produce an amplified output signal, said input signal being influenced by feedback, via a feedback path, upon amplification thereof;

an adaptive feedback compensation filter, supplied as an input with said amplified output signal, that generates a compensation signal, from said amplified output signal, for compensating said feedback, said compensation signal being combined with said input signal; and

a frequency-limiting filter connected relative to said adaptive feedback compensation filter that limits a frequency range within which said adaptive feedback compensation filter compensates said feedback, by frequency-limiting said input to said adaptive feedback compensation filter formed by said amplified output signal said frequency-limiting filter having a filter function that is adaptable during compensation of said feedback by said adaptive feedback compensation filter.

36. A method for compensating feedback in an acoustic amplification system, said feedback acting on an input signal, upon amplification of said input signal, due to a feedback path from an amplified output signal, said method comprising the steps of:

generating a compensation signal in an adaptive feedback compensation filter, supplied as an input with said amplified output signal, from said amplified output signal, for compensating said feedback, and combining said compensation signal with said input signal; and

limiting a frequency range within which said adaptive feedback compensation filter compensates said feedback with a frequency-limiting filter connected relative to said adaptive feedback compensation by frequency-limiting said input to said adaptive feedback compensation filter formed by said amplified output signal, and adapting a filter function of said frequency-limiting filter during compensation of said feedback by said adaptive feedback compensation filter.

37. A method as claimed in claim 36 comprising forming said frequency-limiting filter of a plurality of individual filters, having respective filter functions that, in combination, form said filter function of said frequency-limiting filter.

38. A method as claimed in claim 37 wherein said individual filters have respectively different filter functions, and selecting at least one of said individual filters to adapt said filter function of said frequency-limiting filter.

39. A method as claimed in claim 37 wherein said feedback may occur within a frequency range, and covering said frequency range with respective filter functions of said individual filters, in combination.

40. A method as claimed in claim 36 wherein said frequency-limiting filter has filter coefficients associated therewith, and comprising adapting said filter function of said frequency-limiting filter modification of said coefficients.

41. A method as claimed in claim 36 comprising supplying said amplified output signal to the adaptive feedback compensation filter through said frequency-limiting filter.

42. A method as claimed in claim 36 further comprising adapting said filter function of said frequency-limiting filter with a control unit connected to said frequency-limiting filter.

43. A method as claimed in claim 42 comprising forming said frequency-limiting filter of a plurality of individual filters having respectively different filter functions that in combination form said filter function of said frequency-limiting filter, and comprising operating a changeover switch operated with said control unit to select at least one of said individual filters for adapting said filter function of said frequency-limiting filter.

44. A method as claimed in claim 42 wherein said frequency-limiting filter has filter coefficients, and comprising adjusting at least one of said filter coefficients with said control unit to adapt said filter function of said frequency-limiting filter.

45. A method as claimed in claim 36 comprising combining said compensation signal with said input signal to produce a feedback-compensated input signal, and analyzing said feedback-compensated input signal to determine an effectiveness of said feedback compensation.

46. A method as claimed in claim 45 comprising determining said effectiveness of said feedback compensation by checking a parameter of said adaptive feedback compensation filter.

47. A method as claimed in claim 45 comprising determining the effectiveness of said feedback compensation by comparing said feedback-compensated input signal to said output signal with regard to feedback content.

48. A method as claimed in claim 45 comprising determining the effectiveness of said feedback compensation by measuring said feedback in a frequency range.

49. A method as claimed in claim 36 wherein said input signal is subject to feedback via an acoustic feedback path.

50. A method as claimed in claim 36 wherein said input signal is subject to feedback via an electromagnetic feedback path.

51. A method as claimed in claim 36 comprising connecting an adaptation unit to said adaptive feedback compensation filter, evaluating a signal within said acoustic amplification system in said adaptation unit, and modifying operation of said adaptive feedback compensation filter dependent on the evaluation.

52. A method as claimed in claim 51 comprising supplying said input signal to said adaptation unit for error signal evaluation thereof.

53. A method as claimed in claim 52 comprising supplying said input signal to said adaptation unit through a further frequency-limiting filter.

54. A method as claimed in claim 53 comprising adapting a filter function of said further frequency-limiting filter during said feedback compensation by said adaptive feedback compensation filter.

55. A method as claimed in claim 54 comprising adapting the respective filter functions of said frequency-limiting filter and said further frequency-limiting filter with a control unit connected to said frequency-limiting filter and said further frequency-limiting filter.

56. A method as claimed in claim 55 comprising forming wherein said further frequency-limiting filter of a plurality of individual filters having respectively different filter functions that in combination form the filter function of said further frequency-limiting filter, and operating a changeover switch with said control unit to select at least one of said individual filters to adapt said filter function of said further frequency-limiting filter.

57. A method as claimed in claim 55 wherein said further frequency-limiting filter has filter coefficients, and comprising adjusting at least one of said filter coefficients with said control unit to adapt said filter function of said further frequency-limiting filter.

58. A method as claimed in claim 51 comprising supplying an output of said frequency-limiting filter to said adaptation unit .

59. A method as claimed in claim 58 comprising supplying said output of said frequency-limiting filter to said adaptation unit through a further frequency-limiting filter.

60. A method as claimed in claim 59 comprising adapting a filter function of wherein said further frequency-limiting filter during said feedback compensation by said adaptive feedback compensation filter.

61. A method as claimed in claim 60 comprising connecting a control unit to said frequency-limiting filter and said further frequency-limiting filter and adapting

the respective filter functions of said frequency-limiting filter and said further frequency-limiting filter with said control unit.

62. A method as claimed in claim 61 comprising forming said further frequency-limiting filter of a plurality of individual filters having respectively different filter functions that in combination form the filter function of said further frequency-limiting filter, and operating a changeover switch with said control unit to select at least one of said individual filters to adapt said filter function of said further frequency-limiting filter.

63. A method as claimed in claim 61 wherein said further frequency-limiting filter has filter coefficients, and comprising adjusting at least one of said filter coefficients with said control unit to adapt said filter function of said further frequency-limiting filter.

64. A method as claimed in claim 51 wherein said frequency-limiting filter is a first frequency-limiting filter, and connecting said adaptation unit to receive said input signal and to receive an output from said first frequency-limiting filter, and supplying said input signal to said adaptation unit through a second frequency-limiting filter, and supplying said output from said first frequency-limiting filter to said adaptation unit through a third frequency-limiting filter.

65. A method as claimed in claim 64 comprising providing said second frequency-limiting filter with a filter function that is substantially identical to a filter function of said third frequency-limiting filter.

66. A method as claimed in claim 64 comprising adapting respective filter functions of said second and third frequency-limiting filters during said feedback compensation by said adaptive feedback compensation filter.

67. A method as claimed in claim 66 comprising connecting a control unit to said first, second and third frequency-limiting filters and adapting the respective filter functions of said first, second and third frequency-limiting filters with said control unit.

68. A method as claimed in claim 67 comprising forming each of said second and third frequency-limiting filters of a plurality of individual filters having respectively different filter functions that in combination form the respective filter functions of said first, second and third frequency-limiting filters, and operating a first changeover switch with said control unit to select at least one of said individual filters of said second frequency-limiting filter to adapt the filter function of said second frequency-limiting filter, and operating a second changeover switch with said control unit to select at least one of the individual filters of said third frequency-limiting filter to adapt the filter function of the third frequency-limiting filter.

69. A method as claimed in claim 67 wherein each of said second and third frequency-limiting filters has filter coefficients, and comprising adjusting at least one of the filter coefficients of said second frequency-limiting filter with said control unit to adapt the filter function of the second frequency-limiting filter, and adjusting at least one of the filter coefficients of the third frequency-limiting filter with said control unit to adapt the filter function of the third frequency-limiting filter.

EVIDENCE APPENDIX

Exhibit A: Figs. 1-7 - Filed with the original application on September 10, 2003.

Exhibit B: United States Patent No. 6,831,986 (Kates '986) - Cited in Final Rejection dated July 19, 2006.

Exhibit C: United States Patent No. 6,072,884 (Kates '884) - Cited in Final Rejection dated July 19, 2006.

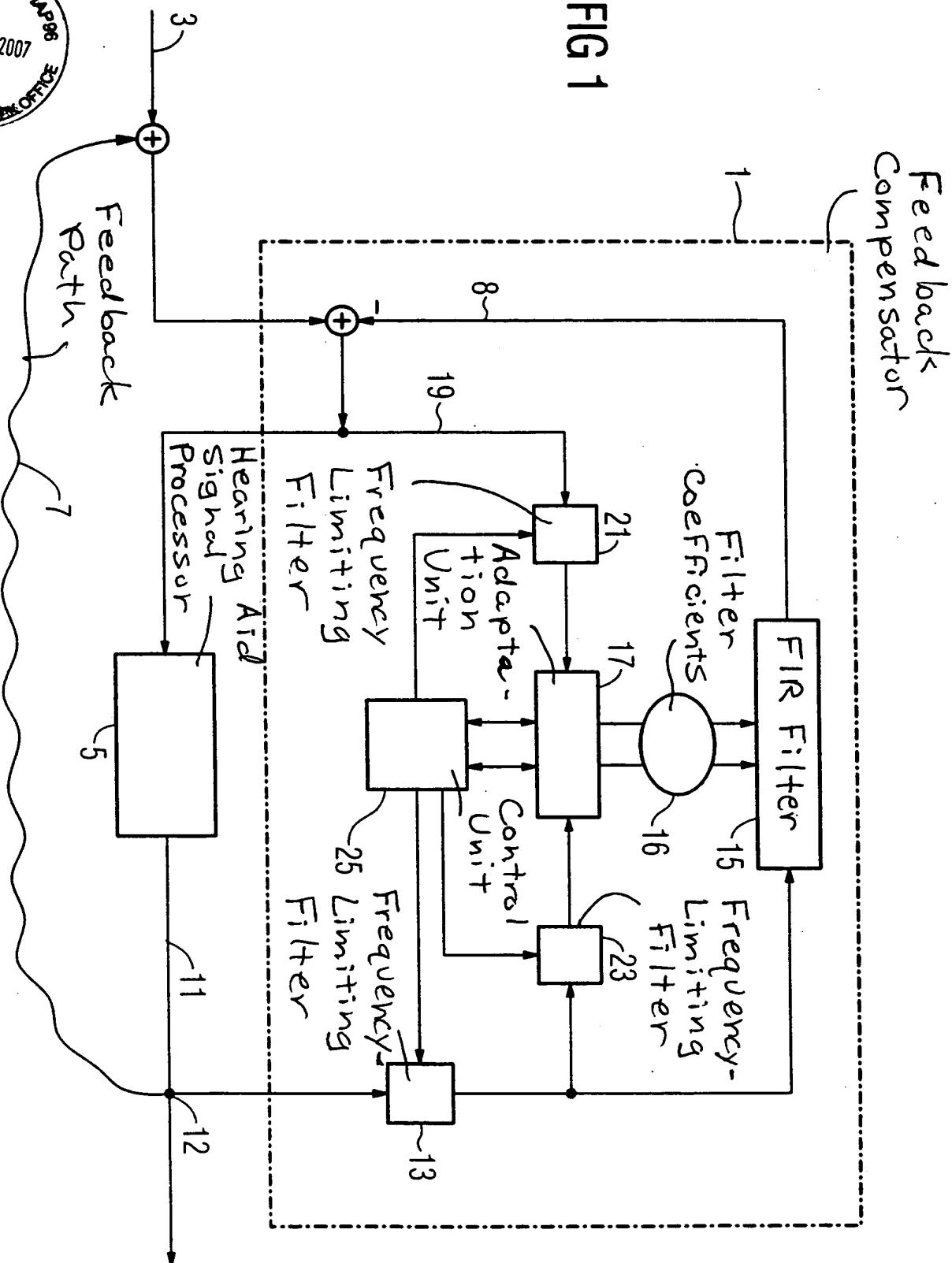
Exhibit D: United States Patent No. 6,404,895 (Weidner) - Cited in Final Rejection dated July 19, 2006.

RELATED PROCEEDINGS APPENDIX

None.

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FIG 1



EXHIBIT

A

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FIG 2

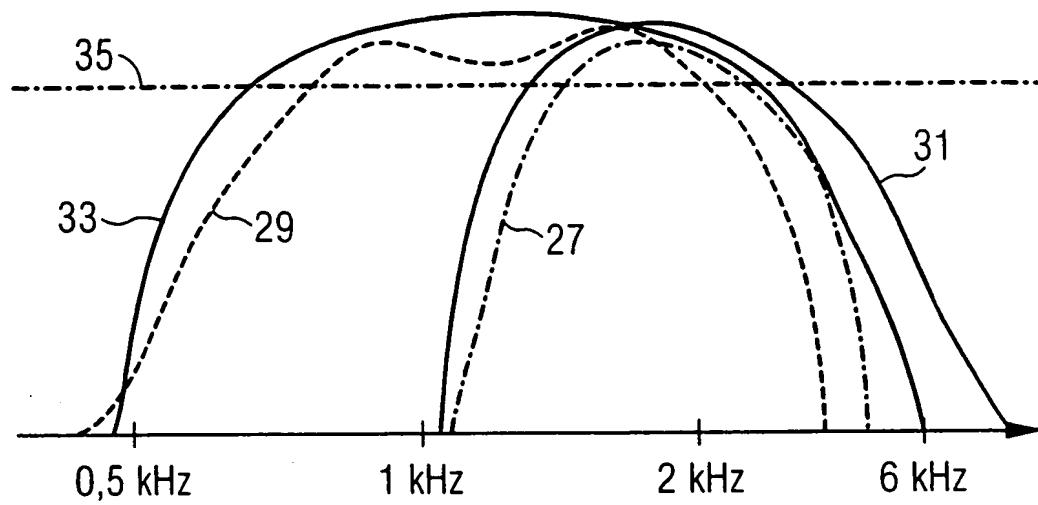


FIG 4

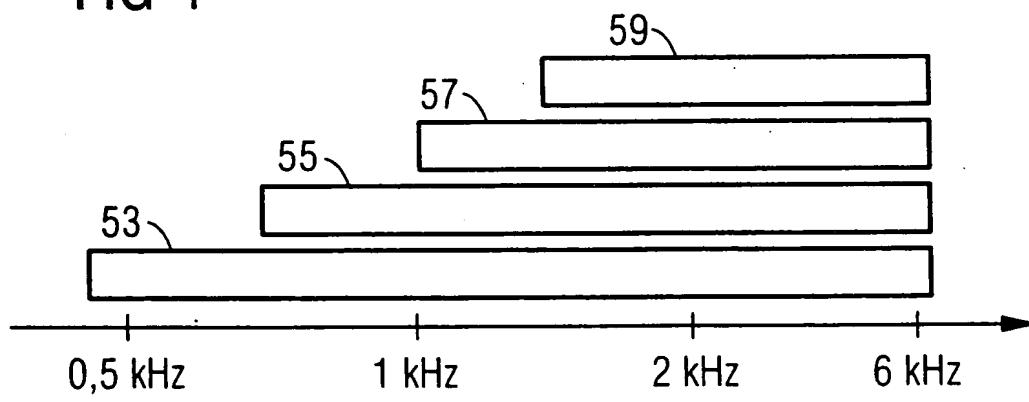
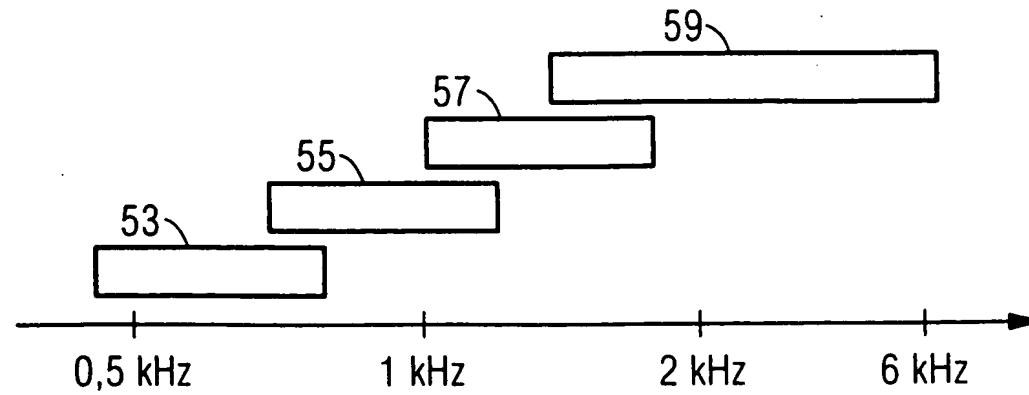
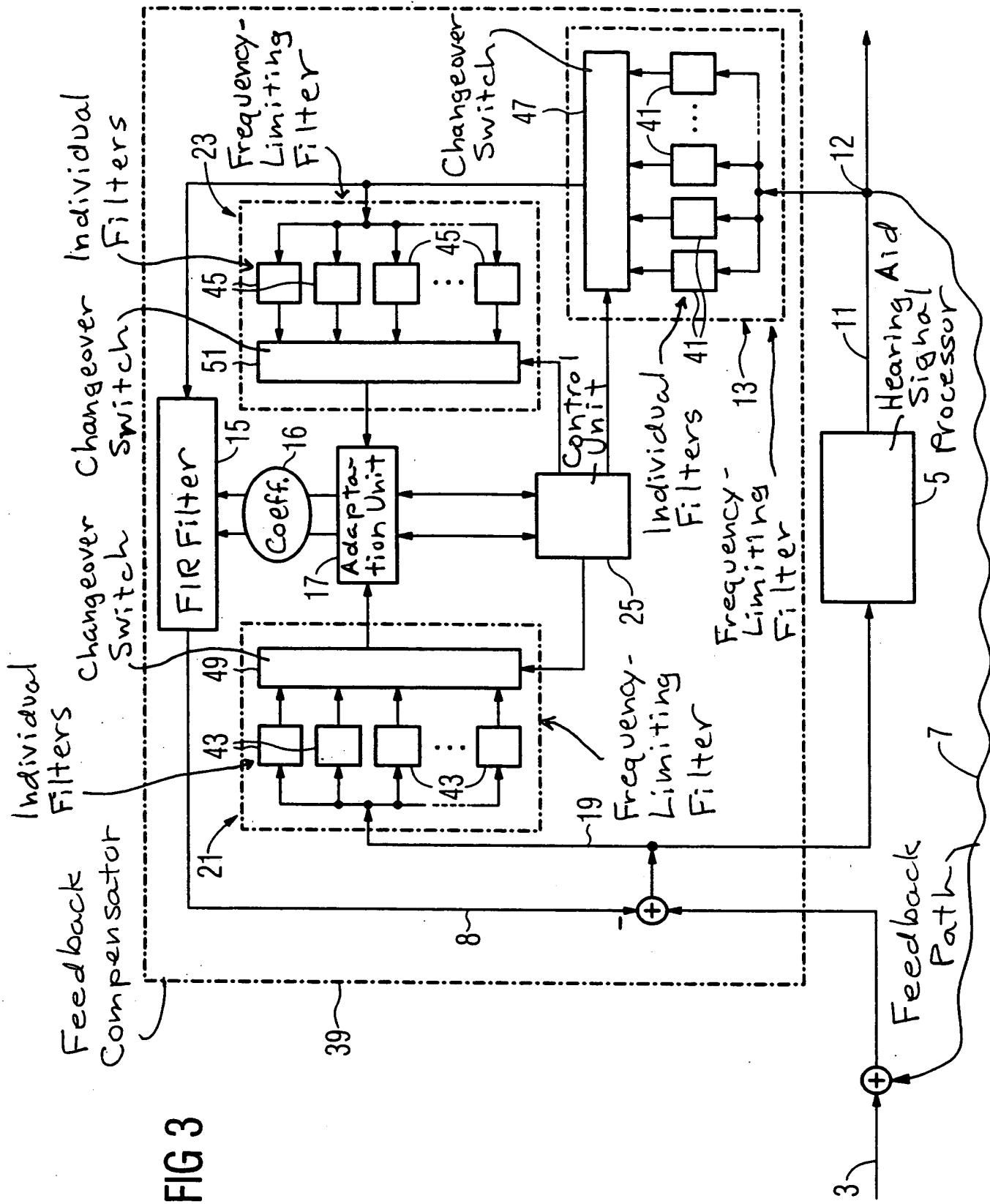


FIG 5





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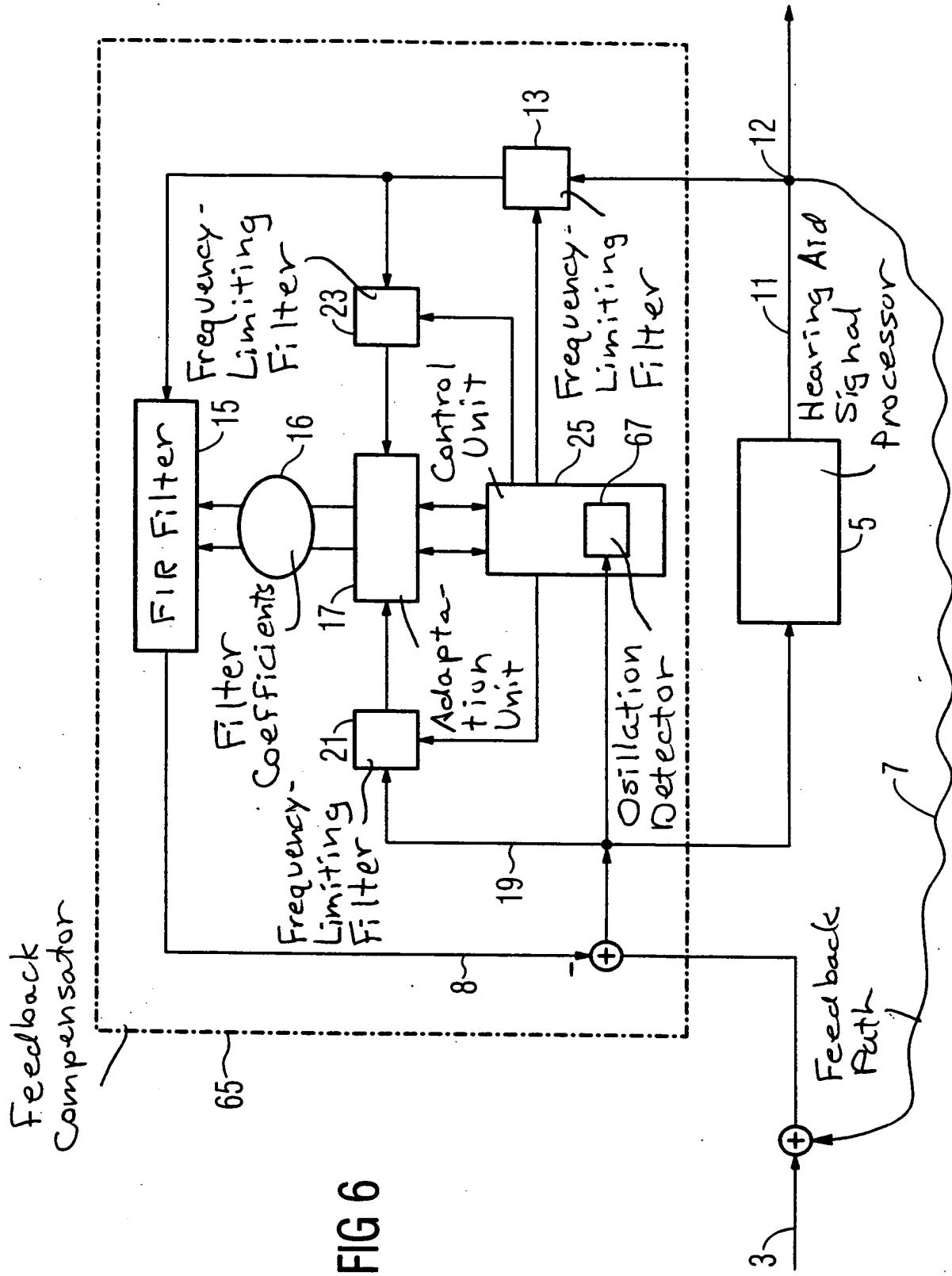
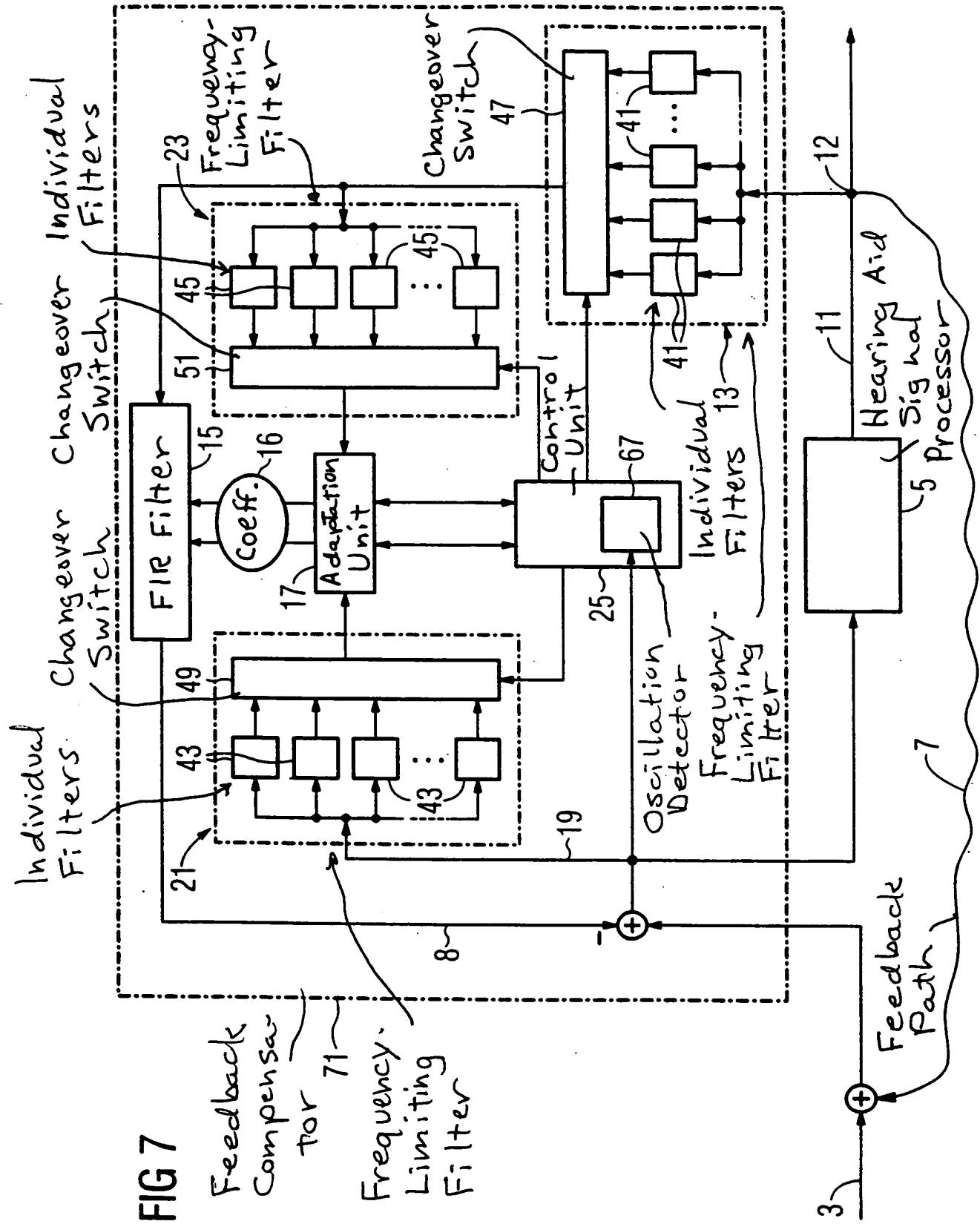


FIG 6

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